1. A magnetic bearing for producing an axially attractive force to support a rotating body, comprising:

a rotor having an axially-facing surface supported for rotation about an axis of rotation; and a stator, axially separated from said rotor surface by an air gap, and magnetically supporting said rotor axially;

said stator having an annular electromagnetic coil attached thereto, and an annular ferromagnetic body having two radially spaced-apart concentric ring poles spaced apart from said rotor surface and defining therewith two annular axial air gaps on a single axial side of said rotor,

an annular ferromagnetic region axially aligned with said stator poles that cooperates magnetically with said stator to produce said attractive force of said bearing;

a permanent magnet in said stator for producing a bias flux through first and second bias flux paths; said first path including portions of both of said ring poles, both of said axial air gaps and said annular ferromagnetic region of said rotor; said second path including a shunt that is magnetically in parallel with said annular ferromagnetic region of said rotor and bypasses said axial air gaps;

said second path having a reluctance to said flux from said permanent magnet that is comparable with magnetic reluctance of said first path;

said electromagnetic coil lies between said ring poles of said stator and has an axis that is oriented co-axially with said axis of rotation and, said coil having leads for connection to a source of electrical power and, when energized by said electrical power, provides a control flux through both air gaps and around said permanent magnet through said shunt.

2. A magnetic bearing as defined in claim 1, further comprising:
multiple poles through which flux passes in each direction between said rotor and stator.

3. A magnetic bearing as defined in claim 1, further comprising:
a plurality of second paths.

4. A magnetic bearing as defined in claim 1, wherein:

said inner ring pole is a solid cylinder.

5. A magnetic bearing as defined in claim 1, further comprising:
a permanent magnet ring on said rotor.

6. A magnetic bearing as defined in claim 1, wherein:
said rotor and said stator both have permanent magnet rings axially facing each other.

7. A magnetic bearing as defined in claim 1, wherein:
said magnet rings are axially polarized.

8. A magnetic bearing as defined in claim 1, wherein:
said magnet rings are radial polarized.

9. A magnetic bearing as defined in claim 1, wherein:
said rotor is a steel flywheel and said stator acts directly on an axial end of said steel flywheel.

10. A magnetic bearing as defined in claim 9, wherein:
said flywheel and said stator constitute the entire magnetic support for said flywheel;
whereby, said flywheel is free of any attached thrust disc used by said magnetic bearing.

11. A magnetic bearing as defined in claim 1, wherein:
said shunt has a high reluctance portion.

12. A magnetic bearing as defined in claim 11, wherein:
said reluctance in said shunt becomes high reluctance only after magnetic saturation by said permanent magnet.

13. A magnetic bearing as defined in claim 1, further comprising:

poles on said rotor axially aligned with said stator poles to provide passive magnetic radial centering.

14. A magnetic bearing as defined in claim 1, wherein:

two of said magnetic bearings are mounted to a fixed support on opposite facing ends of said flywheel.

15. A magnetic bearing as defined in claim 1, wherein:

said axial air gaps define a plane that is exactly perpendicular to said axis of rotation.

16. A process for suspending a large flywheel for high-speed rotation about a vertical axis, comprising:

producing a bias flux with a permanent magnet, and conducting said bias flux through first and second bias flux paths;

said first path including portions of two radially spaced concentric ring poles, both of said axial air gaps, and an annular ferromagnetic region of said rotor between said poles;

said second path including a shunt that is magnetically in parallel with said annular ferromagnetic region of said rotor and bypasses said axial air gaps;

said second path having a reluctance to said flux from said permanent magnet that is comparable with magnetic reluctance of said first path;

producing a control flux in an electromagnetic coil, and conducting said control flux through both air gaps and around said permanent magnet through said shunt; and

modulating said control flux with a control system based on inputs from a position sensor to levitate said flywheel.